

## CLAIMS

1. A data transmission method in a digital telecommunication system, the method comprising the steps of  
placing information units to be transmitted in frames of a lower  
5 protocol in the transmission link,  
transmitting the frames over the transmission link,  
separating said information units from the frames received over the transmission link, **characterized** by  
A) said placing step comprising the steps of  
10 a1) providing said frames with phase indication, which is modulo N and defines a sequence of N frames,  
a2) placing N1 information units in each modulo N frame sequence, wherein N1 is not equal to N,  
B) said separating step comprising the steps of  
15 b1) identifying the phase of each modulo N frame sequence and the starting points of the information units in the frames on the basis of said phase information,  
b2) separating N1 information units from each modulo N frame sequence for further processing.
- 20 2. A method as claimed in claim 1, **characterized** by the telecommunication system being a wireless telecommunication system and the information units being transmitted in radio frames over the radio interface.
- 25 3. A method as claimed in claim 1 ~~or 2~~, **characterized** by said phase indication comprising one of the following: a pseudo-noise code spread over N radio frames; and a sequence number.
3. A method as claimed in claim 1, ~~2 or 2~~, **characterized** by  
30 coding the phase indication as protection against transmission errors.
5. A method as claimed in claim 1, 2, 3 or 4, **characterized** by said information unit being a transmission frame in which data is transmitted over the network interface between a radio access network element and a network adapter.
- 35 6. A method as claimed in claim 1, ~~2, 3 or 4~~, **characterized** by said information unit being the information contents of a transmission frame transmitted over the network interface between a radio access network element and a network adapter.

7. A method as claimed in claim 1, 2, 3 or 4, **characterized** by said information unit being a protocol data unit in an upper layer protocol.

8. A method as claimed in claim 7, **characterized** by said information unit being a protocol data unit, such as a radio link protocol frame, in a link protocol established between a mobile station and a network adapter.

9. A method as claimed in claim 6, **characterized** by said placing step comprising

a1) transmitting 38.4 kbit/s user data in 14.4 kbit/s transmission frames via three 16 kbit/s channels at the network interface, every ninth transmission frame being a dummy frame,

a2) providing 20-ms radio frames with phase indication which is modulo N, wherein  $N > 3$ ,

a3) placing the information contents of N1 transmission frames in each modulo N radio frame sequence, wherein  $N1 > 8$ ,

a4) placing filler bits at the end of the last radio frame N of each radio frame sequence,

said placing step comprising at the reception end the steps of

b1) identifying the phase of each modulo N radio frame sequence and the starting points of the transmission frames in the radio frames on the basis of said phase information,

b2) separating N1 transmission frames from each radio frame sequence for further processing,

b3) rejecting said filler information.

10. A method as claimed in ~~any one of the preceding claims~~, **characterized** by

adding one or more filler bits to the frame sequence, preferably at the end of the last frame, if the bit number required by the N1 information units and phase information is smaller than the total number of information bits in the modulo N frame sequence,

rejecting said one or more filler bits at the reception end.

11. A method as claimed in ~~any one of the preceding claims~~, **characterized** by a remote transcoder unit being arranged between the radio access network element and the network adapter at the network interface and the method comprising the additional steps of

using transmission frames of a first type between said element and the remote transcoder,

using transmission frames of a second type between the remote transcoder and the network adapter,

converting the transmission frames of the first type into transmission frames of the second type in the remote transcoder.

- 5           12. A digital mobile communication system comprising a mobile station (MS), a radio access network element, such as a base station (BTS), a radio interface using channel coding and radio frames between the mobile station and the radio access network element, means in the mobile station and said radio access network element for placing information units in radio frames to be transmitted, and means in the mobile station and said radio access network element for separating the information units from the received radio frames, **characterized** by

- A) the placing means comprising  
          means for providing said radio frames with phase indication (P1,  
15   P2), which is modulo N and defines a sequence of N radio frames,  
          means for placing N1 information units ( $I_1 \dots I_{N1}$ ) in each modulo N radio frame sequence, wherein N1 is not equal to N,

- B) the separation means comprising  
          means for identifying the phase of each modulo N radio frame sequence and the starting points of the information units ( $I_1 \dots I_{N1}$ ) in the radio frames on the basis of the phase information (P1, P2),  
20           means for separating N1 information units ( $I_1 \dots I_{N1}$ ) from each modulo N radio frame sequence for further processing.

13. A system as claimed in claim 12, **characterized** by said  
25   phase indication (P1, P2) comprising one of the following: a pseudo-noise code spread over N radio frames; and a sequence number.

- B.           14. A system as claimed in claim 12, ~~13 or 14~~, **characterized** by said information unit ( $I_1 \dots I_{N1}$ ) being one of the following:  
          a transmission frame in which data is transmitted over the network  
30   interface between the radio access network element (BTS) and a network adapter (IWF),

- the information contents of a transmission frame transmitted over the network interface between the radio access network element (BTS) and the network adapter (IWF),

- 35           a protocol data unit in an upper layer protocol,  
          a protocol data unit, such as a radio link protocol frame, in a link

protocol established between the mobile station (MS) and the network adapter (IWF).

15. A system as claimed in claim 12, ~~13 or 14, character-~~  
 5 ~~ized~~ by the placing means being arranged to add said one or more filler bits  
 to the frame sequence, preferably at the end of the last frame, if the bit num-  
 ber required by the N1 information units and phase information is smaller than  
 the total number of information bits in the modulo N frame sequence.